DATA ANALYSIS FRAMEWORK

The Economic Impact of Improvements in Preventative Medical Initiatives and Allied Health Care in Australia, Canada, South Africa, Ireland, and the UK

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PROBLEM

There is an urgent need to understand the intricate relationship between preventative medical initiatives, allied health care improvements, people-centered health, and digital initiatives and the subsequent economic ramifications in Australia, Canada, South Africa, Ireland, and the UK. Without comprehensive insight into these dynamics, nations may face challenges in effectively allocating budgets, resources, and educational efforts to bolster overall health and wellness. Clear data is pivotal for shaping informed policy changes, ensuring appropriate resource distribution, and guiding educational strategies; ensuring adoption of best practices and the maximization of workforce productivity and quality of life for their citizens.

Problem Question:

How do improvements in preventative medical initiatives and allied health care influence economic outcomes and what are the comparative implications for health expenditure, productivity, and overall economic growth in these countries?
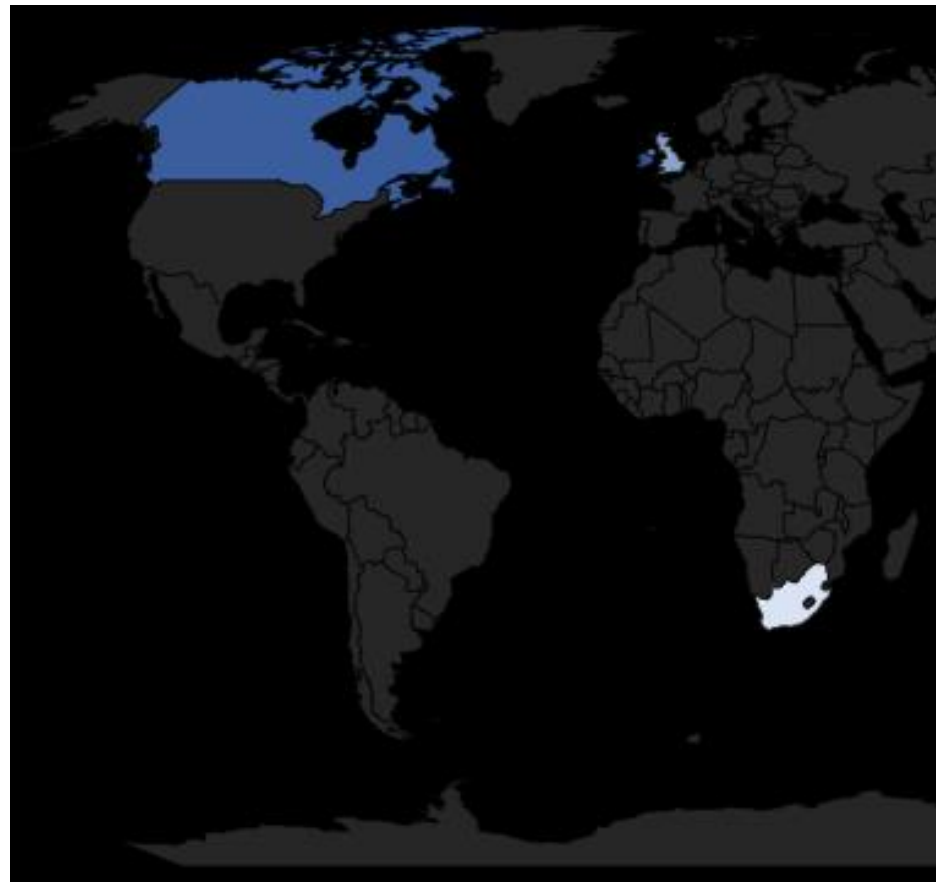
VISION

To quantitatively assess and compare the economic benefits and cost savings associated with advancements in preventative medical initiatives and allied healthcare practices in Australia, Canada, South Africa, Ireland, and the UK, and to provide evidence-based recommendations for policymakers in these countries to further optimize health-related economic outcomes.

Our goal is to derive actionable insights on accessibility, comprehension, and affordability, with an aim to influence evidence-based health policy formation, government budget allocation, corporate health strategies, and public health education.

Objective:

Influence policy, budget allocation, corporate health strategies, and public health education to facilitate a more inclusive, efficient, and patient-centric healthcare experience.

PROBLEM QUESTIONS

Economic Benefits & Cost Savings

1. What is the net economic benefit of preventative medical initiatives in each of the countries (Australia, Canada, South Africa, Ireland, and the UK)?
2. How do the cost savings from allied healthcare practices compare across these countries?
3. What percentage of the national budget in each country is allocated to preventative healthcare, and how does this correlate with health outcomes?

Accessibility

1. What is the accessibility rate of preventative medical care in urban versus rural regions of these countries?
2. What influence does the transportation infrastructure in these countries have on healthcare accessibility?
3. Are there specific regions or demographics that are underserved, and if so, why?

Comprehension & Public Health Education

1. How effective have public health education campaigns been in improving comprehension of preventative and/or treatable medical conditions in each country?
2. How does public health literacy correlate with positive health outcomes in these nations?
3. What role does the level of education play in shaping public health literacy?

Affordability

1. How have healthcare costs evolved in these countries, especially in relation to the national GDP and average household income?
2. Are there specific medical services or treatments that have seen a significant increase or decrease in affordability?
3. How does health insurance coverage (public and private) impact the affordability of primary healthcare and diagnostics in each country?

Workforce

1. What is the ratio of healthcare professionals to the general population in each country?
2. How do workforce statistics correlate with health outcomes in these countries?
3. What are the trends in tertiary education for the future healthcare workforce?

Benchmarking

1. How do the above metrics for Australia, Canada, South Africa, Ireland, and the UK compare to average metrics from the OECD, WHO, World Bank, and UNESCO?
2. Which countries serve as the best models or benchmarks for each of the above areas of interest?
3. What best practices from these benchmark countries can be adopted by the others?

Policy & Strategy Recommendations

1. Based on the data, which policy interventions have the highest potential to improve health outcomes and economic benefits in each country?
2. How can corporate health strategies be modified to further support the national objectives of improving healthcare accessibility, comprehension, and affordability?
3. Which public health education initiatives could be most effective in the near future, and why?

ANALYSIS TRACKS

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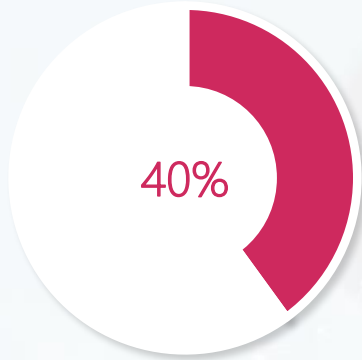
Economic

ROI of Primary, Public, and Allied Health and contribution to the GDP

Recommend areas or demographics that might benefit from financial subsidies (government and/or insurance fails to cover needs)*

40%
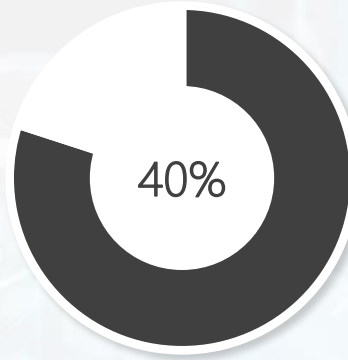
Social

Population health, life expectancy, and quality of life improvements due to Health initiatives

Targeted health services, health literacy, and telehealth programs for regions or groups with pronounced gaps

20%
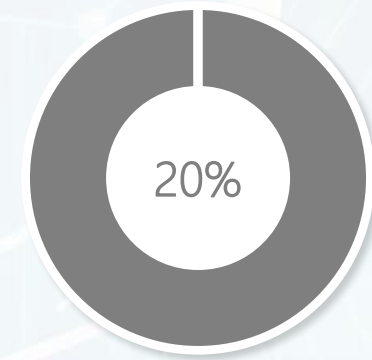
Policy

Effectiveness of NHIs, allocation and utilization of tax funds, and potential areas for policy refinement

: Propose better transport links or new facility locations based on identified healthcare deserts

*Medical Aid/Insurance business case: Identify demographics underserved by current insurance products.

VALUE PROPOSITION

50%
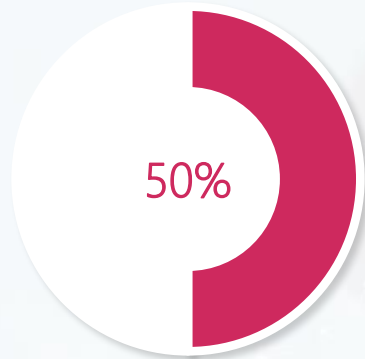
Public Health

Align healthcare budgets and resources with identified groups and areas of need

Shape healthcare policies around data-driven insights to maximize efficacy

35%
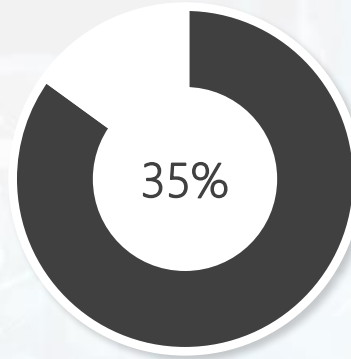
Allied Health

Insight into market dynamics to recognize underserved areas for business expansion or service improvements

Recognition, referral Network, and NHI/NHS Budget Allocation

15%
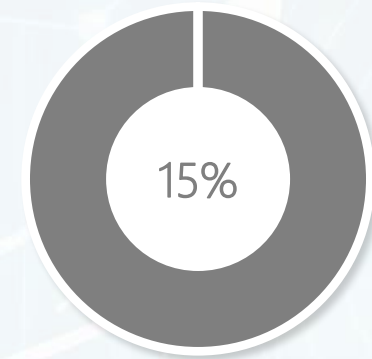
Workforce

Equip citizens with data to negotiate better health services

Increase health literacy initiatives to reach groups in need

Health and Productivity Benefits

DATA CONSIDERATIONS

Ethics
- Adhere to data privacy laws of each country.
- Utilize anonymized datasets or public domain data to uphold privacy standards.
- Ensure that the analysis is not introducing or perpetuating bias.

Data Storage Management
- Opt for secure, encrypted cloud storage with regular backups.
- Introduce a structured data management system to ease organization, indexing, and data retrieval.
- Track changes in data, code, and models and maintain change control documentation.

International Benchmarks
- Contextualize the public health outcomes, economic impacts, and health initiatives of the five countries against international standards and benchmarks.

Continuous Review
- When model is deployed, monitor its performance over time and adjust as needed.
- As data collection evolves, perpetually refine data extraction techniques to ensure up-to-date relevance and comprehensiveness.

DATA SOURCES

Data applied from **2021 onwards** to evaluate the current impacts of preventative medical initiatives, allied health care, and broader public health measures on economic outcomes in **Australia, Canada, Republic of Ireland, South Africa, and the UK**

National Public Health Data*

- WHO global health expenditure database
- OECD published data
- Government health databases
- Hospital records
- Medical insurance claims
- Distribution of resources

Allied Health Data

- WHO global health expenditure database
- OECD published data
- Association databases
- Medical insurance claims
- National statistical websites
- Allied Health network density

Economic Data

- World Bank open data
- WHO global health expenditure database
- UN economic data
- OECD published data
- National statistics websites
- National budget documents

Workforce Statistics and Insights

- World Bank open data
- WHO global health expenditure database
- OECD published data
- Department of Health /NHS
- National statistics websites
- Published academic papers

Transportation

- National transport websites
- National statistics websites
- International transport forum
- National infrastructure data
- World Bank transport data
- Transport route maps

Education

- UNESCO institute for statistics
- OECD published data
- World Bank education data
- Department of Education data
- National statistics websites
- Published awareness programs

Social Media Listening: Use Brandwatch or Talkwalker to gauge public sentiment on health services.

NATIONAL HEALTH DATA

National healthcare budgets typically encompass a broad range of services, activities, and investments aimed at ensuring the health and well-being of a country's population.

Country-specific granular data, statistics, and insights will be obtained from the following sources:

1. Australia:
- *Australian Institute of Health and Welfare (AIHW):* This organization provides a broad range of health and welfare statistics.
- *Australian Bureau of Statistics (ABS) - Health:* Offers health-related statistics as a subset of its broader database.
- *MyHospitals:* An online platform that provides performance data for public and private hospitals in Australia.
- *Pharmaceutical Benefits Scheme (PBS):* Lists details about medicines available under the Australian government's subsidy scheme.

2. Canada:
- *Canadian Institute for Health Information (CIHI):* Delivers detailed health-related statistics and insights.
- *Health Canada:* The federal department overseeing health; its website contains many publications and datasets.
- *Public Health Agency of Canada:* Offers data on diseases, conditions, and public health programs.
- *StatsCan - Health:* Part of Statistics Canada, it provides comprehensive health-related statistics.

3. South Africa:
- *Department of Health:* Offers a variety of publications and reports, including health statistics and policy documents.
- *Health Systems Trust:* A non-profit focused on health systems research, policy development, and training.
- *South African Medical Research Council (SAMRC):* Provides health research findings and statistical data.

4. Ireland:
- *Health Service Executive (HSE):* Manages and delivers health and personal social service in Ireland.
- *Department of Health:* Provides health statistics, research, and policy documents.
- *Health Protection Surveillance Centre (HPSC):* Offers data on infectious diseases and related topics.
- *Irish Health Repository:* A platform containing various research documents, including health statistics and reports.

5. UK:
- *National Health Service (NHS) Digital:* Provides a vast range of data, including health and care statistics.
- *NHS England - Publications:* Offers various reports and data on the performance of the NHS.
- *Office for National Statistics (ONS) - Health and Social Care:* Part of the broader ONS, it provides comprehensive health and care statistics.
- *Public Health England (PHE):* Provides information on public health issues, research, and statistics.

Time Series Analysis: Cross-reference health infrastructure growth with demographic changes.

Cross referenced with WHO, OECD, UNESCO, and World Bank data

ALLIED HEALTH DATA

Healthcare professions distinct from medicine, dentistry, and nursing. These professionals provide a variety of diagnostic, technical, therapeutic, and support services.

Some of the country-specific granular data, statistics, and insights will be obtained from the following sources:

1. Australia:
- *Services Australia:* Provides data on claims made through the Medicare Benefits Schedule (MBS) and Pharmaceutical Benefits Scheme (PBS), which includes services delivered by allied health professionals.
- *Allied Health Professions Australia (AHPA):* The national peak body representing and advocating for the role of allied health professionals in Australia.
- Chiropractors' Association of Australia (CAA); Australian Physiotherapy Association (APA); Dietitians Australia; Speech Pathology Australia; Occupational Therapy Australia.

2. Canada:
- *Canadian Institute for Health Information (CIHI):* Provides data on various health services, including those provided by allied health professionals.
- *Health Canada:* The federal department has relevant data and reports on allied health professions and their roles in the Canadian healthcare system.
- Canadian Chiropractic Association (CCA); Canadian Alliance of Audiology and Speech-Language Pathology Regulators (CAASPR); Canadian Association of Occupational Therapists (CAOT); Canadian Physiotherapy Association (CPA); Canadian Society of Respiratory Therapists (CSRT).

3. South Africa:
- *Health Professions Council of South Africa (HPCSA):* This is the governing body for various health professions in the country, including many allied health roles.
- Chiropractic Association of South Africa (CASA); South African Society of Physiotherapy (SASP); Dietetics-Nutritionists Association of South Africa (ADSA); Occupational Therapy Association of South Africa (OTASA); Speech Therapy and Audiology Association of South Africa.

4. Ireland:
- *CORU:* This is Ireland's multi-profession health regulator. Registration data and other relevant reports concerning allied health professions.
- *Health and Social Care Professionals Council:* They provide oversight for various allied health professions and have relevant data and reports.
- Chiropractic Association of Ireland (CAI); Irish Society of Chartered Physiotherapists (ISCP); Association of Occupational Therapists of Ireland (AOTI); Irish Nutrition and Dietetic Institute (INDI); Irish Association of Speech & Language Therapists (IASLT).

5. UK:
- *Health and Care Professions Council (HCPC): A* regulatory body for health and care professionals in the UK. They have data on registrants and release reports on the state of the professions they regulate.
- *NHS Digital:* Specific data related to services provided by allied health professionals in the UK.
- British Chiropractic Association (BCA); Chartered Society of Physiotherapy (CSP); Royal College of Occupational Therapists (RCOT); British Association of Behavioural and Cognitive Psychotherapies (BABCP).

Cross referenced with WHO, OECD, UNESCO, and World Bank data

ECONOMIC & WORKFORCE DATA

Economic Disparities: Deep dive into how income bands intersect with health access.
Health and Wellness: Focus on health factors affecting work attendance and productivity.

Country-specific granular data, statistics, and insights will be obtained from the following sources:

1. Australia:
- *Australian Bureau of Statistics (ABS):* Comprehensive source for economic, health, social data, unemployment, and attendance rates.
- *Australian Institute of Health and Welfare (AIHW):* Statistics on the health workforce including diseases affecting work and other health-related statistics.
- *Department of Health:* Reports and datasets related to healthcare employment and trends.
- *The Commonwealth Budget:* The official source for Australian federal government budget information.

2. Canada:
- *Statistics Canada:* The national statistical agency providing workforce data, including unemployment and attendance rates, and health statistics..
- *Canadian Institute for Health Information (CIHI):* Information on Canada's health systems and the health of Canadians, including workforce data and diseases affecting work.
- *Health Canada:* Data and insights on health workforce distribution and trends.
- *Department of Finance Canada:* Publishes the federal budget, providing details on government spending and revenue.

3. Ireland:
- *Central Statistics Office (CSO):* Official statistics, including data on unemployment, attendance, health, and the economy.
- *Health Service Executive (HSE):* Data related to healthcare professionals and employment within the health services.
- *Health Research Board (HRB):* Provides health-related data and supports health research.
- *Department of Health:* Reports and datasets that can provide insights into the healthcare workforce.
- *Department of Finance, Ireland:* Responsible for economic and financial matters, including the national budget.

4. South Africa:
- *Statistics South Africa (Stats SA):* Provides statistical data, including on labor, unemployment, attendance, economic indicators, and health.
- *South African Medical Research Council (SAMRC):* Information on health research and diseases affecting work.
- *South African Department of Health:* Reports and statistics related to the health workforce.
- *Health Professions Council of South Africa (HPCSA):* Licensing and regulatory body that may have workforce statistics.
- *National Treasury of South Africa:* The primary source for the country's budget and financial data.

5. UK:
- *Office for National Statistics (ONS):* Comprehensive data on unemployment, attendance, health, and other economic statistics.
- *NHS Digital: D*ata and information about the National Health Service, including diseases affecting work and workforce statistics.
- *The King's Fund:* An independent think tank that might have reports and analyses on healthcare workforce trends and challenges.
- *HM Treasury:* The UK government's economic and finance ministry, publishing the national budget.

Cross referenced with WHO, OECD, UNESCO, and World Bank data

NATIONAL TRANSPORT DATA

Accessibility Analysis: Evaluate regions with limited transportation options to health services.
Rural vs. Urban: Understand disparities in transport infrastructure.

Country-specific granular data, statistics, and insights will be obtained from the following sources:

1. Australia:
- *Bureau of Infrastructure, Transport and Regional Economics (BITRE):* Provides transport-related statistics, including those related to roads, rail, maritime, and aviation.
- *Australian Bureau of Statistics (ABS):* Includes data on various aspects of transport in its surveys and reports.
- *Transport and Infrastructure Council:* Produces national policy and guidelines on various transportation topics.

2. Canada:
- *Transport Canada:* The federal department responsible for transportation policies and programs. It offers data on various transport sectors.
- *Statistics Canada:* Provides data on transport, infrastructure, and related topics in its surveys.
- *Canadian Transportation Agency:* Offers insights and statistics on national transportation.

3. Ireland:
- *Central Statistics Office (CSO):* Publishes transport-related statistics, including those on road, rail, and air transport.
- *Department of Transport, Tourism and Sport:* Provides policy direction, statistical reports, and various publications on transport matters.
- *Transport Infrastructure Ireland (TII):* Offers data related to road and rail infrastructure.

4. South Africa:
- *Department of Transport:* Provides policy, reports, and statistics on various transport modes in South Africa.
- *Statistics South Africa (Stats SA):* Includes transport-related data in its national surveys.
- *Transport Forum:* A special interest group that discusses and shares data and insights on transport issues in South Africa.

5. UK:
- *Department for Transport:* Offers a wide range of transport statistics, including data on roads, rail, aviation, and maritime.
- *Transport Scotland:* For transport data specific to Scotland.
- *Office for National Statistics (ONS):* Provides some transport-related data in its national reports.

Google Maps API: Extract data on transportation networks, connectivity, and travel times across all 5 countries.

GIS Integration: Merge geospatial data with health and transport datasets for geospatial insights.

Health Reach Metric: Facilities within a 30-minute travel radius for any citizen.

Cross referenced with International Transport forum (OECD data) and World Bank Transport data

NATIONAL EDUCATION DATA

Health Literacy and Education: Evaluate access to information and public knowledge across groups. Future Workforce: A view on the future state of primary and allied healthcare.

Country-specific granular data, statistics, and insights will be obtained from the following sources:

1. Australia:
- *Australian Institute of Health and Welfare (AIHW) – Health Literacy:* Reports and data on health literacy initiatives and the health workforce education.
- *Australian Bureau of Statistics (ABS) - Health:* Information on public health literacy rates and access to health information
- *HealthInfoNet:* Offers resources on Indigenous health literacy and education programs.

2. Canada:
- *Canada Health Infoway:* Initiatives to improve access to digital health information.
- *Health Canada:* The federal department overseeing health; its website contains many publications and datasets.
- *Public Health Agency of Canada:* Programs and resources focusing on health literacy and health promotion.
- *StatsCan - Health:* Provides data on public health literacy and access to health-related information.

3. South Africa:
- *Department of Health:* Information on health literacy programs and healthcare education.
- *Health Systems Trust:* Research on health literacy, access to health services, and healthcare education initiatives.
- *South African Medical Research Council (SAMRC):* Publications related to health education and health literacy.

4. Ireland:
- *Health Service Executive (HSE):* Manages and delivers health and personal social service in Ireland.
- *Department of Health:* Initiatives and resources focused on improving public health literacy.
- *Irish Medical Council:* Data and statistics related to medical and allied health education.

5. UK:
- *National Health Service (NHS) Digital:* Provides a vast range of data, including health and care statistics.
- *NHS – Health Literacy:* Resources and tools for healthcare professionals to support patients' understanding of health information.
- *Health Education England:* Focused on healthcare education, including training statistics for various allied health professions.
- *Public Health England (PHE):* Reports and programs on health literacy, access to health information, and improvement initiatives.
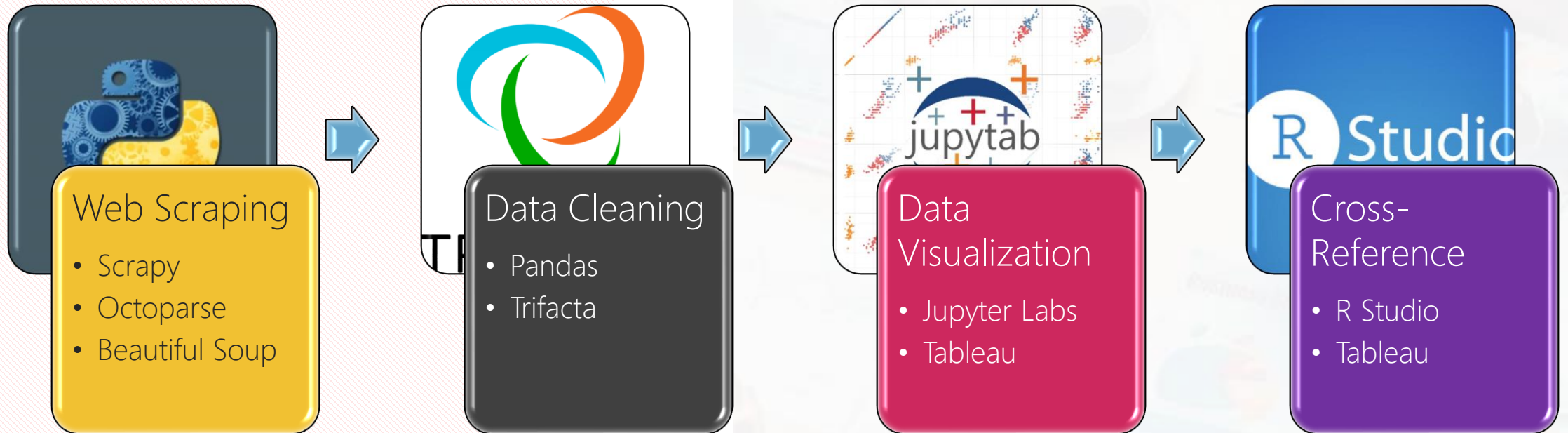
Digital Health Penetration: Ratio of telemedicine to traditional health consultations.

Cross referenced with WHO, OECD, UNESCO, and World Bank data

DATA TOOLS

Web Scraping
- Scrapy
- Octoparse
- Beautiful Soup

Data Cleaning
- Pandas
- Trifacta

Data Visualization
- Jupyter Labs
- Tableau

Cross-Reference
- R Studio
- Tableau

DATA COLLECTION AND VERIFICATION

Digital Data Collection

Employ data mining tools and web scraping techniques to gather datasets from online platforms: government databases, health departments' portals, and international benchmarking platforms.

Comparative Modelling

Convert and clean data.

Create a model to comparatively analyze the five countries. This model will account for disparities in health care systems, public health campaigns, funding, and performance metrics.

Cross-referencing

Confirm data integrity by cross-referencing multiple sources and databases for consistency.

Historical Analysis

Gauge the efficacy of contemporary strategies against historical performance data.

WORKING WITH THE DATA

Exploratory Data Analysis

Use graphs and charts to visualize distributions, relationships, and patterns in the data.

Use descriptive statistics to summarize the data.

Identify potential relationships or associations between variables.

Data Modelling

Select an appropriate analytical or statistical model.

Use a subset of the data to train the model, and another subset to validate its accuracy.

Adjust model parameters to improve performance if necessary.

Evaluation

Evaluate the model's performance using performance metrics.

Assess the differences between observed and predicted values.

Ensure the model is generalizable and not overfitting to the training data.

Interpret & Communicate

Translate the analytical findings into meaningful insights.

Document the methodology, results, and conclusions in a comprehensive manner.

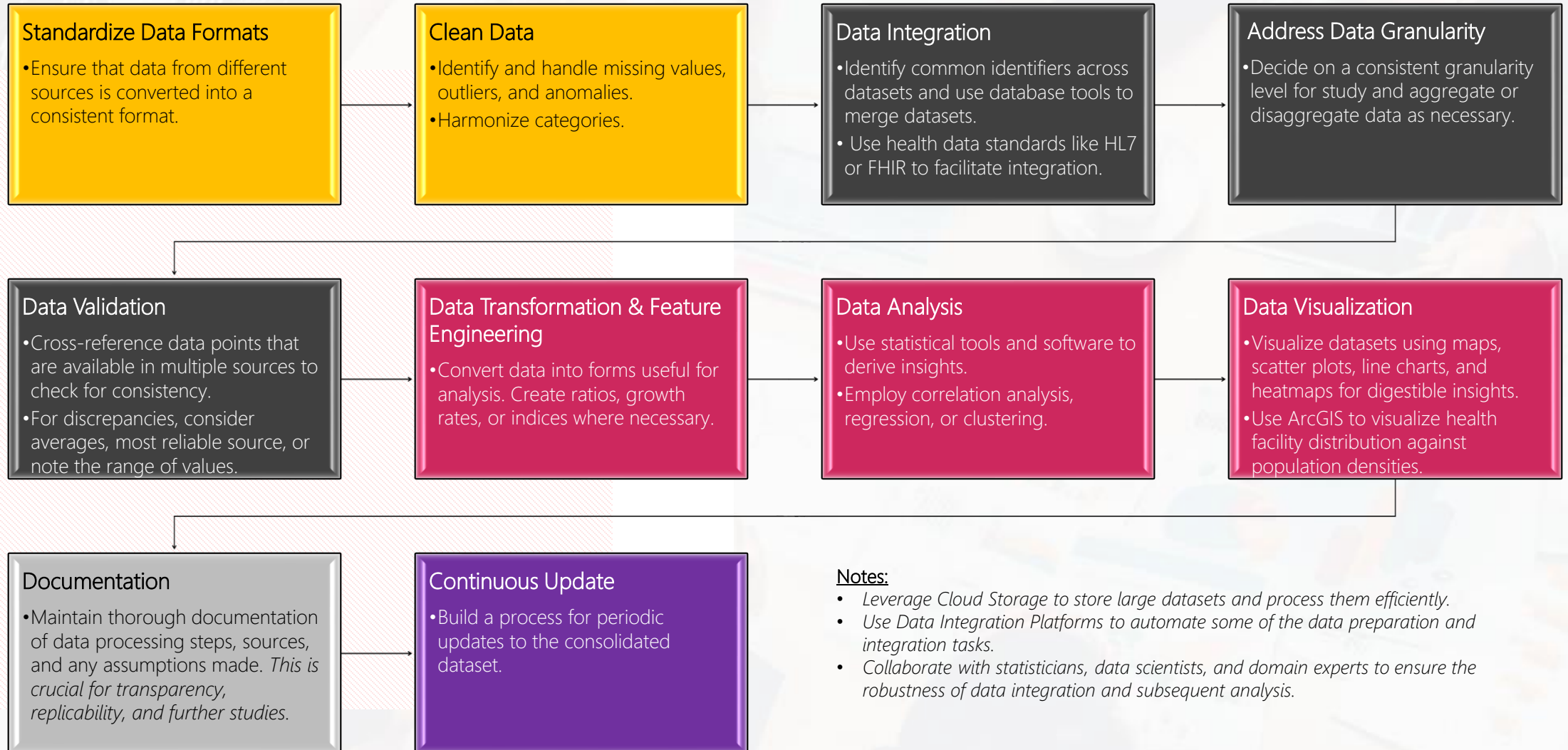Communicate findings to stakeholders using visual aids, charts, and narratives.

Implement & Action

Deploy model in a real-world scenario.

Provide actionable insights or suggestions.

WORKING WITH THE DATA

Standardize Data Formats
- Ensure that data from different sources is converted into a consistent format.

Clean Data
- Identify and handle missing values, outliers, and anomalies.
- Harmonize categories.

Data Integration
- Identify common identifiers across datasets and use database tools to merge datasets.
- Use health data standards like HL7 or FHIR to facilitate integration.

Address Data Granularity
- Decide on a consistent granularity level for study and aggregate or disaggregate data as necessary.

Data Validation
- Cross-reference data points that are available in multiple sources to check for consistency.
- For discrepancies, consider averages, most reliable source, or note the range of values.

Data Transformation & Feature Engineering
- Convert data into forms useful for analysis. Create ratios, growth rates, or indices where necessary.

Data Analysis
- Use statistical tools and software to derive insights.
- Employ correlation analysis, regression, or clustering.

Data Visualization
- Visualize datasets using maps, scatter plots, line charts, and heatmaps for digestible insights.
- Use ArcGIS to visualize health facility distribution against population densities.

Documentation
- Maintain thorough documentation of data processing steps, sources, and any assumptions made. *This is crucial for transparency, replicability, and further studies.*

Continuous Update
- Build a process for periodic updates to the consolidated dataset.

Notes:
- *Leverage Cloud Storage to store large datasets and process them efficiently.*
- *Use Data Integration Platforms to automate some of the data preparation and integration tasks.*
- *Collaborate with statisticians, data scientists, and domain experts to ensure the robustness of data integration and subsequent analysis.*

EDA - HEALTH BUDGET
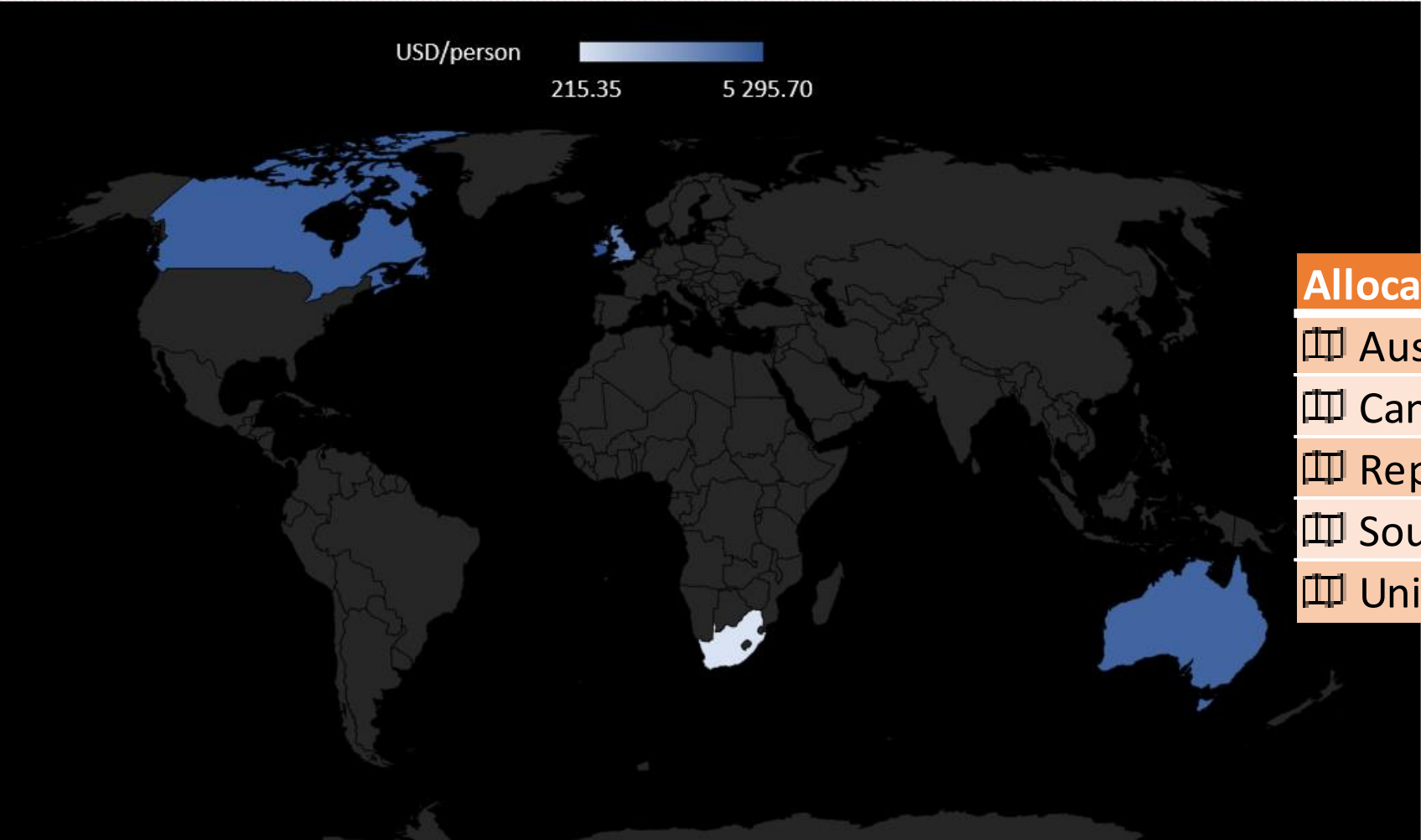
Health Budget	Fiat (Billion)	USD (Billion)
Australia	137.60	86.70
Canada	217.92	157.73
Republic of Ireland	24.10	25.38
South Africa	248.80	13.01
United Kingdom	213.00	257.42

Allocated per Perso	USD
Australia	$ 4 719.89
Canada	$ 4 953.42
Republic of Ireland	$ 5 295.70
South Africa	$ 215.35
United Kingdom	$ 3 800.30

EDA - HEALTH BUDGET
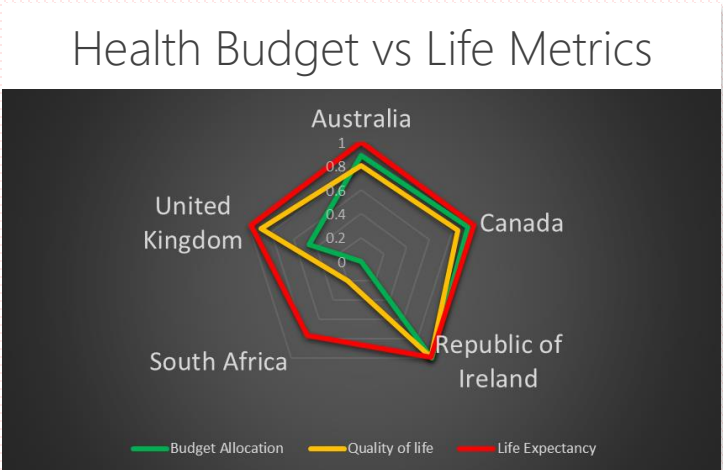
$ 257.42B
Highest Health Budget: UK
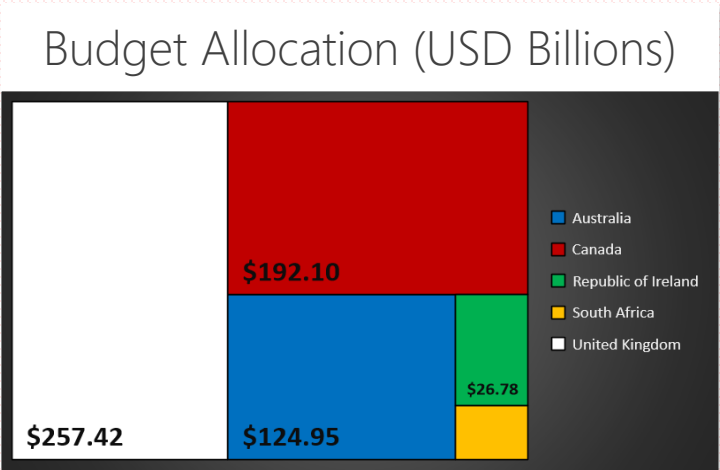
Lowest: South Africa $13.01B

$ 5,295.70
Highest / person: Ireland

Lowest: South Africa $215.35

Ireland (pop 5.06M)	$5295.70
Canada (pop. 38.78M)	$4,953.42
Australia (pop. 26.47M)	$4,719.89
UK (pop. 67.74M)	$3,800.30

Budget Allocation (USD Billions)

$192.10

$26.78

$257.42 $124.95

- ■ Australia
- ■ Canada
- ■ Republic of Ireland
- ■ South Africa
- □ United Kingdom

Health Budget vs Life Metrics

—— Budget Allocation —— Quality of life —— Life Expectancy

Ireland rank first in Healthcare Budget per capita and overall quality of health

Canada is a close second

South Africa ranks last with $215.35 allocated per person (pop. 60.41M)

INPUTS - INSIGHTS – ACTION – IMPACT

Country-level inputs

- Demographic characteristics
- Risk factor profiles
- Disease epidemiology
- Healthcare expenditure
- Labour market characteristics

Microsimulation
year by year per individual

- Use of healthcare services and labour force participation
- Broader economy
- Population with individual profiles
- Disease incidence

Country-level outputs

- Health outcomes
- Healthcare expenditure
- Labour force productivity
- GDP
- Fiscal pressure

THANK
YOU

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